

(21) Application No: 0412324.6

(22) Date of Filing: 02.06.2004

(30) Priority Data:
(31) 0314673 (32) 24.06.2003 (33) GB
(31) 0404181 (32) 25.02.2004

(71) Applicant(s):
Smiths Group Plc
(Incorporated in the United Kingdom)
765 Finchley Road, LONDON, NW11 8DS,
United Kingdom

(72) Inventor(s):
Diane Gibson
Derek Robert Harkness McGaw

(74) Agent and/or Address for Service:
J M Flint
765 Finchley Road, LONDON, NW11 8DS,
United Kingdom

(51) INT CL⁷:
A47L 9/24

(52) UK CL (Edition X):
A4F FSCH

(56) Documents Cited:
WO 2003/024294 A1 WO 2003/004627 A1
DE 019738329 A1

(58) Field of Search:
UK CL (Edition W) A4F
INT CL⁷ A47L
Other: Online: WPI, EPODOC, PAJ

(54) Abstract Title: Vacuum cleaner with suction retractable hose length

(57) A vacuum cleaner, schematically shown as 1, is equipped with a suction hose 2 which can be collapsed or retracted in length by virtue of the suction generated by the vacuum cleaner itself. To this end the distal end of the wand 34, has a manually operable valve 30 which when rotated, shuts off the passage through the hose and thus causes a vacuum to be formed by the continuing suction of the cleaner motor, thus causing the hose to collapse in length due to its corrugations. The valve itself may be of generally spherical form, with a series of passages 44 in one direction to allow air flow, but with a continuous surface at 90 degrees to the plane of the passages, to seal off the hose passage. In a preferred embodiment the wand has a specially formed handle [fig.5 not shown] which has a trigger to operate the valve.

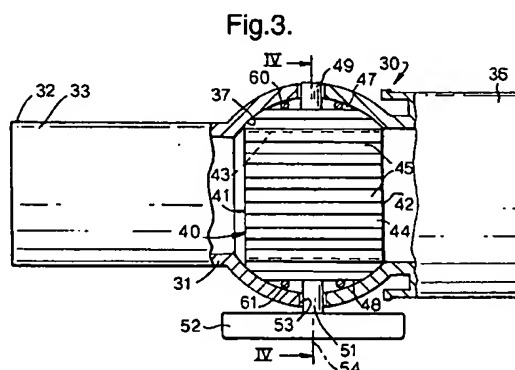
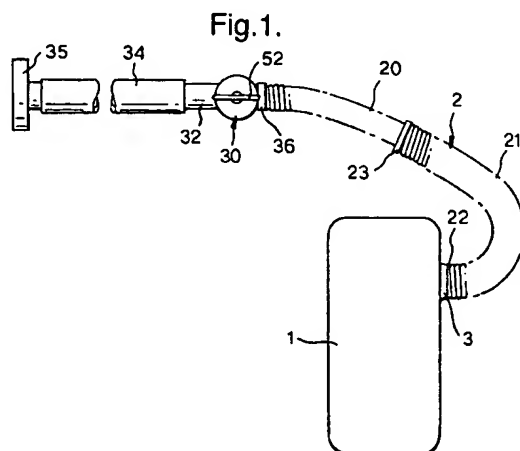


Fig.1.

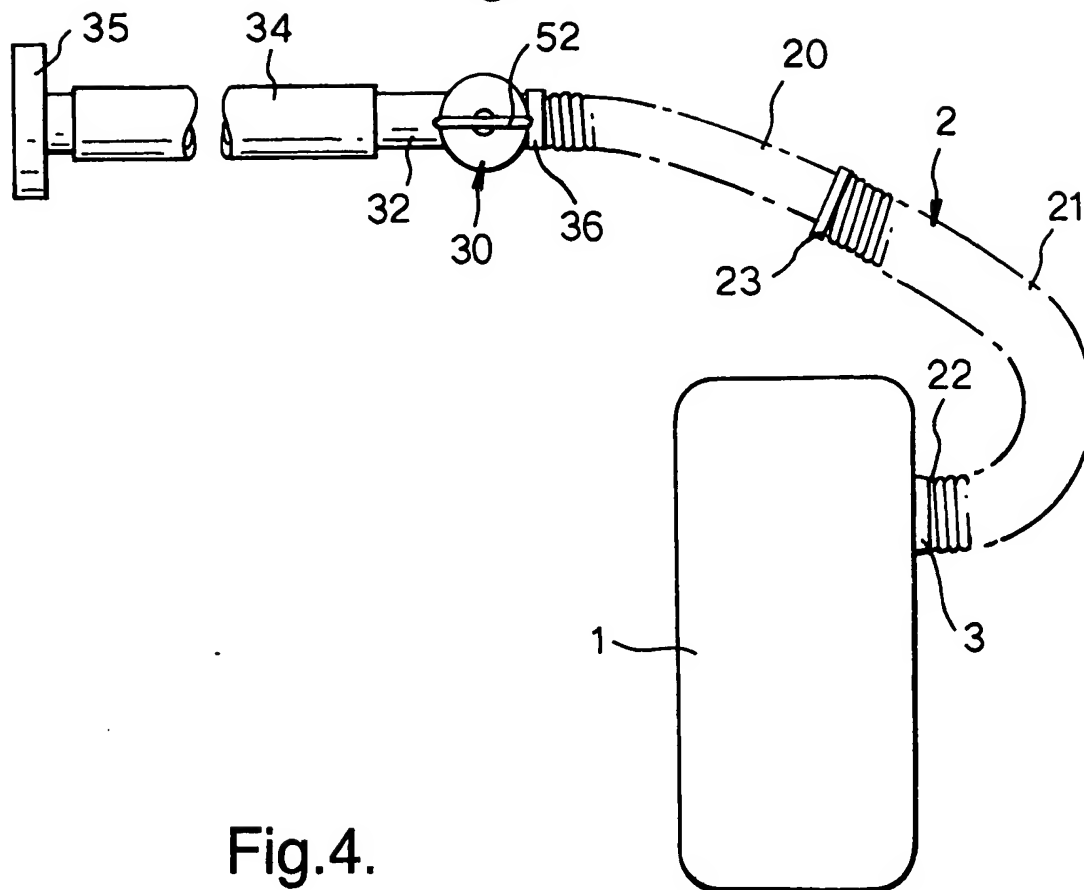


Fig.4.

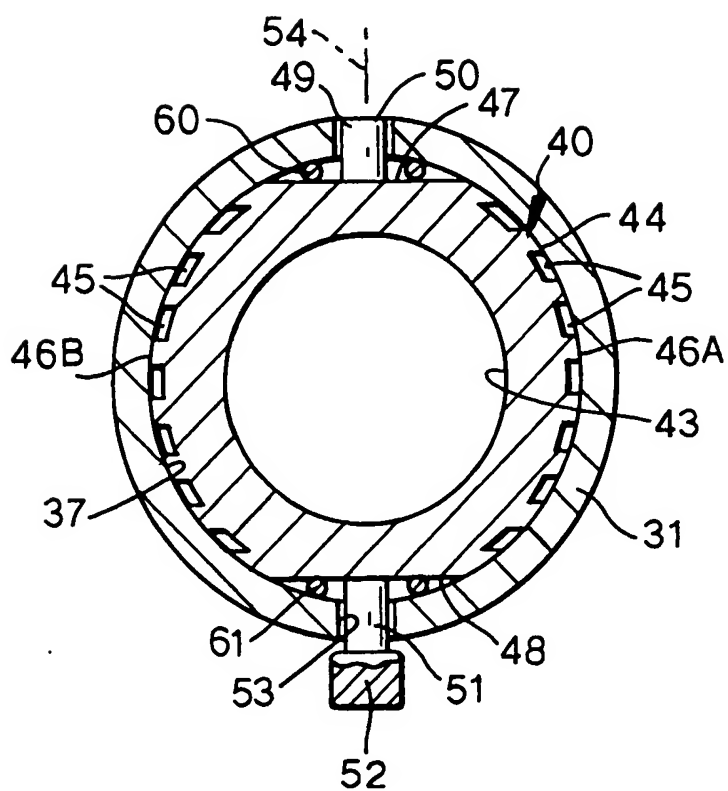


Fig.2.

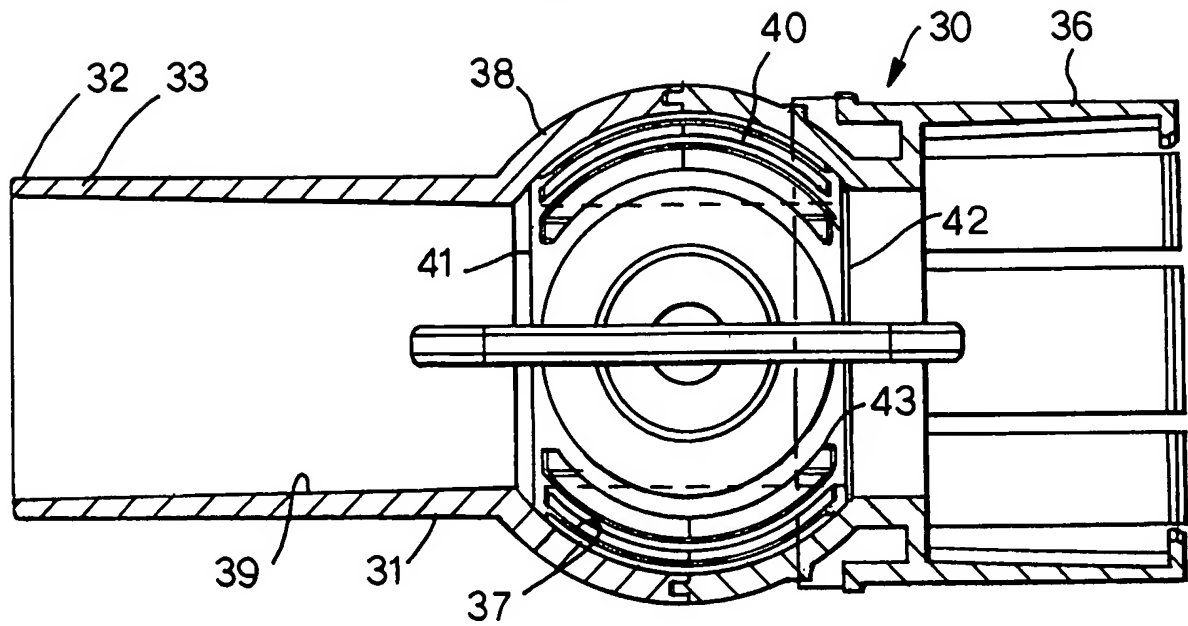


Fig.3.

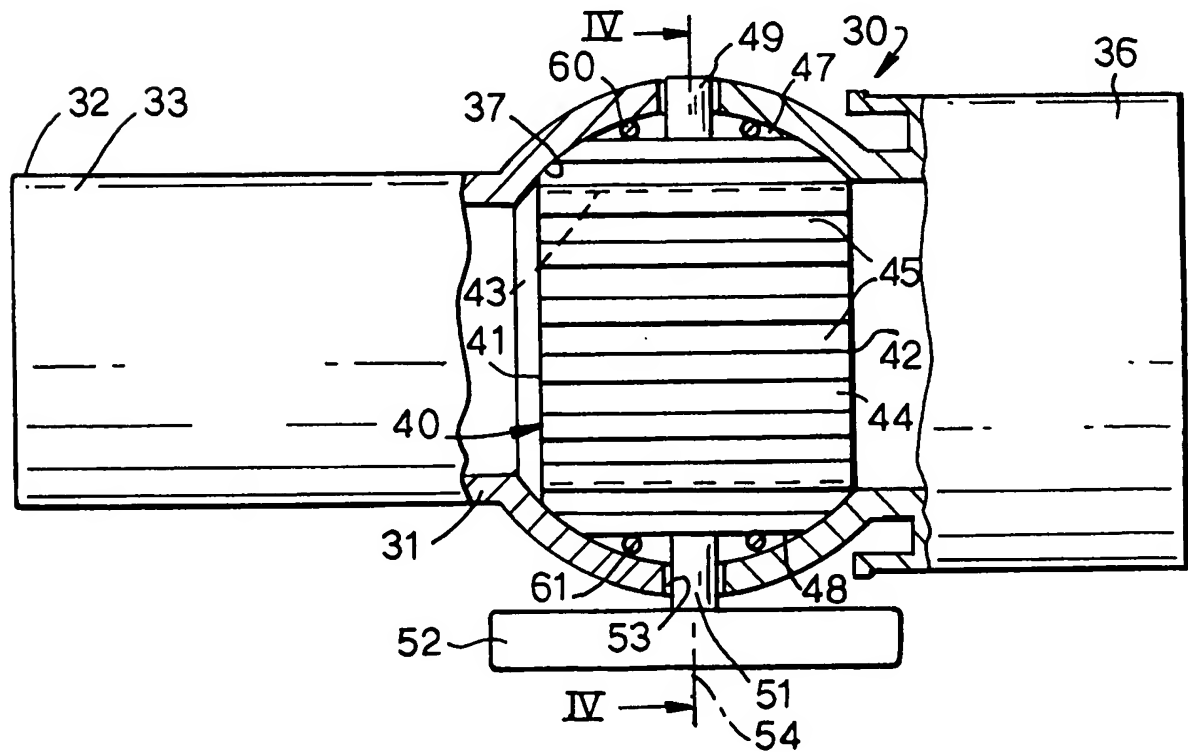
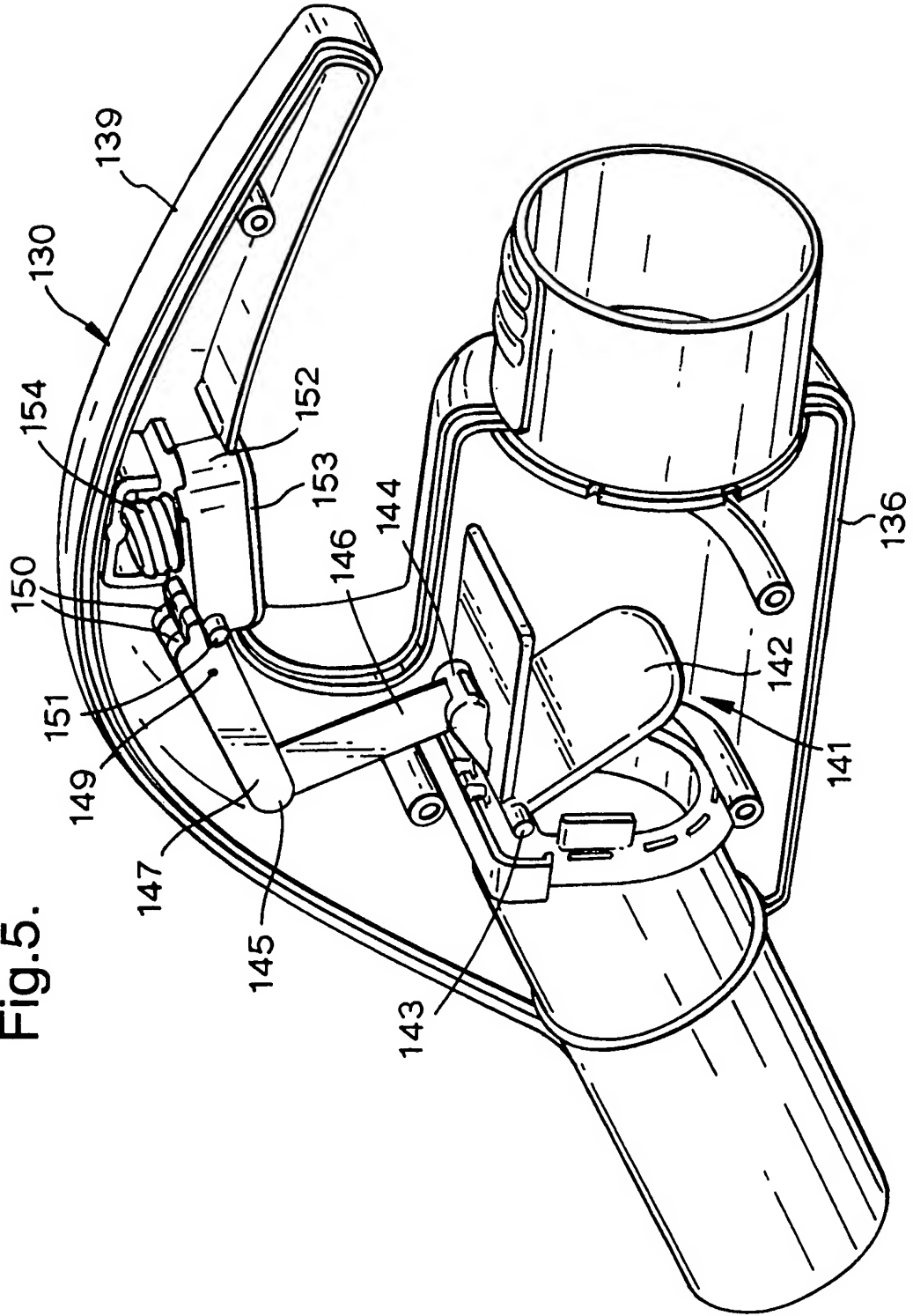


Fig.5.



VACUUM CLEANER APPARATUS AND HOSES

This invention relates to vacuum cleaner apparatus and hoses.

Vacuum cleaners may be of the upright kind where cleaning suction is applied by means of a pump having an inlet directly below the machine. Cylinder vacuum cleaners, by contrast, have an inlet connected to one end of a hose, the other end of which connects to a suction cleaning head. Upright cleaners also usually have provision by which an accessory hose can be connected to the inlet so that a hand-held suction head can be used to clean regions that would otherwise be inaccessible to the machine. The hoses used with vacuum cleaners tend to be bulky so that they have to be stored separately from the cleaner. An alternative hose available on some vacuum cleaners as sold by the major manufacturers has stretch characteristics with a natural, retracted length (when not in use) less than its extended length (when in use). The extended length may be about six times the retracted length. Although this hose has the advantage of being much easier to store than conventional hoses, its resilience may make it more difficult to use in some situations, especially with cylinder vacuum cleaners, which are lighter than upright cleaners.

WO 03/024294 describes a vacuum cleaner hose that can be retracted in length by the application of suction and that can be retained in its retracted length on the vacuum cleaner or in a separate outer container. Other hoses retracted in length by suction are described in DE 19738329, WO 99/35954, EP 1011408, EP 388676 and US 4050113.

It is an object of the present invention to provide an alternative hose and vacuum cleaner apparatus including such a hose.

According to one aspect of the present invention there is provided vacuum cleaner apparatus including a vacuum cleaner with a suction inlet, a flexible hose that can be extended and retracted in length, the hose being connected at one end with the suction inlet, the other end of the hose being connected with a handle assembly, the handle assembly including a valve member and a manually-actuable member coupled with the valve member, the valve member having a first, natural position in which the valve member is open enabling flow of material through a bore through the handle assembly into the hose and being displaceable to a second position by actuation of the manually-actuable member in which flow into the hose is substantially restricted so that pressure reduces in the hose and it retracts in length, and the valve member being arranged to return to its first position when the manually actuable member is released.

The valve member may have an external surface of circular shape and be mounted within a recess of circular shape within the handle assembly so as to be rotatable about its axis. The valve member may have a bore therethrough extending transverse to the axis of rotation of the valve member so that the valve member can be rotated between a first position in which the bore through the valve member is substantially aligned with the bore through the handle assembly and a second position in which the bore through the valve member is substantially out of alignment with the bore through the handle assembly.

According to another aspect of the present invention there is provided vacuum cleaner apparatus including a vacuum cleaner with a suction inlet, a flexible hose connected at one end with the suction inlet and having a natural extended length retractable to a shorter length by suction applied by the cleaner, the other end of the hose being connected with a generally tubular handle assembly having an axial bore therethrough communicable with the hose, the handle assembly including a valve member having an external surface of circular shape mounted within a recess of circular section in the handle assembly such that the valve member is rotatable about an axis transverse to the handle, the valve member having a bore therethrough extending transverse to the axis of rotation so that the valve member can be rotated between a first position in which the bore through the valve member is substantially aligned with the bore through the handle assembly so that flow is enabled along the handle assembly and a second position in which the bore through the valve member is substantially out of alignment with the bore through the handle assembly and flow is thereby restricted, and a manually-actuable member extending from the valve member to enable the valve member to be rotated about its axis so that flow into the hose can be restricted to cause it to retract in length.

The manually-actuable member may be rotatable. The valve member is preferably of ball shape and may have a plurality of grooves on its outer surface extending parallel to a bore through the valve member. The handle assembly preferably includes a spring arranged to urge the valve member to the first position.

According to a further aspect of the present invention there is provided a hose assembly for vacuum cleaner apparatus according to any one of the preceding claims.

According to a fourth aspect of the present invention there is provided a method of operating vacuum cleaner apparatus including the steps of applying suction to one end of a flexible hose, manipulating a cleaning head by means of a handle attached to the opposite end of the hose to clean, subsequently manually closing a valve in the handle to retract the hose in length, securing the hose in its retracted length and releasing the valve to enable it to open.

The valve may be manually closed by rotating a user-actuable member on the handle to rotate a valve member in the handle so as to close the valve and thereby retract the hose in length, the hose being secured in its retracted length, and the user-actuable member being released to enable the valve to open. The valve member is preferably a ball shape.

Vacuum cleaner apparatus including a hose according to the present invention, will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a side elevation view of the vacuum cleaner apparatus; and

Figure 2 is a sectional side elevation of the handle of the hose assembly;

Figure 3 is a sectional plan view of the forward end of the hose assembly;

Figure 4 is a cross sectional view of the handle along the line IV-IV of Figure 3;
and

Figure 5 is a partly cut-away perspective view of an alternative handle.

With reference first to Figures 1 to 4, the apparatus comprises a cylinder vacuum cleaner 1 and a hose assembly 2 connected at the suction inlet 3 of the cleaner.

The vacuum cleaner 1 may be entirely conventional.

The hose assembly 2 includes an inner retractable hose 20 with an extended length of about 3 metres and a shorter outer flexible extensible storage hose 21 attached with the outer hose at a coupling 22 at the rear end of the assembly. Preferably the inner hose 20 is of the kind described in WO 03/024294 having a helical support wire and a flexible outer sleeve that folds outwardly between turns of the wire when the hose is retracted in length. The coupling 22 is attached to the suction inlet 3 of the vacuum cleaner 1. At the forward end of the hose assembly 2 the inner hose 20 is attached to the rear end of a handle assembly 30, which is described in greater detail below. The hose assembly 2 is retracted in length using the suction power of the vacuum cleaner 1 by blocking flow of material through the hose so that a reduced pressure is created within it. The inner hose 20 is held in its retracted state by connecting a coupling 23 at the forward end of the outer storage hose 21 to the rear end of the handle assembly 30 so that the length of the outer hose limits the total length of the hose assembly 2.

The handle assembly 30 includes a tubular, moulded plastics housing 31 of circular section. The forward end 32 of the housing 31 is tapered to provide a male coupling 33

shaped to receive the rear end of a rigid telescopic cleaning wand 34. The forward end of the cleaning wand 34 is coupled with a conventional cleaning head 35. The rear end 36 of the housing 31 is sealed with the forward end of the inner hose 20. Close to its rear end 36, the housing 31 is formed with an enlarged internal recess 37 of part-spherical shape aligned with the axis of the handle 30, forming an annular protrusion 38 around the handle.

A valve member in the form of a moulded plastics ball 40 is seated within the recess 37. The ball 40 is truncated at opposite ends to form flat, parallel end faces 41 and 42. A bore 43 of circular section extends axially between the end faces 41 and 42, the diameter of the bore being equal to that of the bore 39 through the main part of the housing 31. On its external surface 44, the ball 40 is moulded with a series of grooves 45 extending parallel with one another and with the bore 39. The grooves 45 extend along two opposite regions 46 (Figure 4) each extending around about 90° of the surface 44, leaving two mounting locations 47 and 48 directly opposite one another. One mounting location 47 has a short cylindrical spigot 49 projecting diametrically outwardly and locating within a hole 50 in the housing 31. The other mounting location 48 has a short spigot 51 terminated by a manually-actuable member in the form of a toggle 52. The spigot 51 extends outwardly through a hole 53 in the housing 31, directly opposite the hole 50, with the toggle 52 being located outside the housing and lying close to its surface. Two springs 60 and 61 locate between the ball 40 and the housing 31 having opposite ends secured with the ball and with the housing. The springs 60 and 61 urge the ball 40 to the open position shown where the bore 43 through the ball 40 is aligned axially with the bore 39 through the housing 31. The ball 40 can be rotated through about 90° about the transverse axis 54 through the spigots 49 and 51 by gripping the toggle 52 and twisting it about this axis. Stops (not shown) on the inside surface of the housing 31

and on the ball 40 limit the angle through which the ball can be rotated in the closing direction. When the toggle 52 is released, the springs 60 and 61 rotate the ball 40 relative to the housing 31 back to its open position with the two bores 43 and 39 in alignment. The stops also prevent the springs 60 and 61 rotating the ball 40 beyond the open position.

When the hose assembly 2 is being used to clean, the ball valve 40 is in its natural, open state allowing flow along the handle 30. The bore 43 through the ball 40 provides a substantially uninterrupted continuation of the bore 39 through the handle 30 so that it contributes little turbulence and impediment to flow. When the user wishes to retract the hose assembly 2 to its shortened length for storage he twists the toggle 52 to rotate the ball 40 against the action of the springs 60 and 61. This causes the bore 43 through the ball 40 to rotate out of alignment with the bore 39 through the handle 30, thereby blocking flow through the handle and the inner hose 20. As a result, pressure in the inner hose 20 drops, allowing it to retract in length into the outer hose 21. The inner hose 20 is maintained in its retracted length by connecting the coupling 23 at the forward end of the outer hose 21 onto the handle 30. The toggle 52 is then released, allowing the ball valve 40 to open and pressure to be restored in the inner hose 20. The grooves 45 around the exterior surface 44 of the ball 40 are primarily for moulding purposes but it has been found that they allow a small amount of air to leak between the outside of the ball and the housing 31 when the ball is being moved between the open and closed positions. This helps make the change between the valve being fully open and fully closed more gradual.

Alternative valve members having an external surface of circular shape could be used and, in this respect, the term "circular" is intended to cover part-circular shapes as well as a

complete circular shape. The valve member could be of cylindrical shape mounted in a cylindrical recess extending transversely of the handle, the valve member having a bore extending transversely of the axis of the cylinder in alignment with the bore through the handle. The manually-actuable member need not itself be rotatable since it could, for example, be connected with the ball by gearing to allow linear movement of the member to rotate the ball.

The valve member need not be circular since other forms of valve member are also possible, which are arranged to return to an open position when released. For example, the valve member could be in the form of a flap as described below with reference to Figure 5.

A handle assembly 130 has an outer moulded plastics housing 136 with a handle 139 on its upper surface, which extends rearwardly and is curved along its length. The housing 136 contains a valve assembly 141 by which flow of material through the hose assembly is controlled. The valve assembly 141 comprises a flap valve 142 with a transverse pivot mounting 143 at its upper end. On its rear surface the flap member 142 has a short laterally-extending arm 144 displaced a short distance from the pivot mounting. The arm 144 is coupled with the lower end of a linkage 145 comprising two straight arms 146 and 147. The lower arm 146 is connected with the arm 144 and extends upwardly and slightly forwardly into the handle 139. The upper end of the arm 146 is pivotally connected with the forward end of the second arm 147. The second arm 147 extends rearwardly into the handle and is mounted with the housing by a transverse pivot 149 close to its rear end. The rear end of the second arm 147 has two cam surface extensions 150 on the opposite side of the pivot 149. The cam surfaces 150 are contacted by two short laterally projecting pegs 151 at the forward

end of a manually-actuable button 152. The button 152 is of rectangular shape and is located close to the forward end of the handle 139. The button 152 has a lower surface 153 facing downwardly, which projects a short distance through a rectangular aperture in the underside of the handle. A helical spring 154 is compressed between the upper surface of the button and the inside of the upper surface of the handle 139 so that the button is urged down.

The shape of the handle 139 is such that it can be gripped by four fingers of one hand extending beneath the handle and with the thumb and palm of the hand resting on the upper surface of the handle. The button 152 is located in the same position as the forefinger of the hand so that this naturally rests on the button. The user manipulates the cleaning head 133 by holding the handle 139.

In its normal, natural state, as used when cleaning is in progress, the button 152 is in its lower, extended position and the flap valve 142 is open so that air, dust and other material can flow freely through the handle assembly 130. The direction of the flow is such as to keep the valve 142 open.

When the user wishes to retract the hose to its shortened length for storage he squeezes the button 152 with his forefinger to push it upwardly against the action of the spring 154. This pushes the pegs 151 against the cam extensions 150 thereby pushing up the right-hand end of the upper arm 147. This pushes down the left-hand end of the upper arm 147 and hence pushes the lower arm 46 down along its length. Downward movement of the lower arm 146 pushes down the arm 144 attached with the flap valve 142 and hence rotates the flap valve clockwise about its pivot 143 so that its lower end moves forwardly against the

end of the coupling 131. This prevents or substantially restricts flow of material through the handle 130 and hence through the inner hose. As a result, pressure in the inner hose drops allowing the hose to retract in length into the outer hose. The button 152 can then be released allowing the valve 142 to open and pressure to be restored in the inner hose.

It will be appreciated that the present invention could be used on any form of vacuum cleaner including cylinder cleaners, upright cleaners, central vacuum cleaner installations, fixed garage forecourt cleaners or the like.

CLAIMS

1. Vacuum cleaner apparatus including a vacuum cleaner with a suction inlet, a flexible hose that can be extended and retracted in length, the hose being connected at one end with the suction inlet, the other end of the hose being connected with a handle assembly, the handle assembly including a valve member and a manually-actuable member coupled with the valve member, wherein the valve member has a first, natural position in which the valve member is open enabling flow of material through a bore through the handle assembly into the hose and is displaceable to a second position by actuation of the manually-actuable member in which flow into the hose is substantially restricted so that pressure reduces in the hose and it retracts in length, and wherein the valve member is arranged to return to its first position when the manually actuable member is released.
2. Vacuum cleaner apparatus according to Claim 1, wherein the valve member has an external surface of circular shape and is mounted within a recess of circular shape within the handle assembly so as to be rotatable about its axis.
3. Vacuum cleaner apparatus according to Claim 2, wherein the valve member has a bore therethrough extending transverse to the axis of rotation of the valve member so that the valve member can be rotated between a first position in which the bore through the valve member is substantially aligned with the bore through the handle assembly and a second position in which the bore through the valve member is substantially out of alignment with the bore through the handle assembly.

4. Vacuum cleaner apparatus including a vacuum cleaner with a suction inlet, a flexible hose connected at one end with the suction inlet and having a natural extended length retractable to a shorter length by suction applied by the cleaner, the other end of the hose being connected with a generally tubular handle assembly having an axial bore therethrough communicable with the hose, wherein the handle assembly includes a valve member having an external surface of circular shape mounted within a recess of circular section in the handle assembly such that the valve member is rotatable about an axis transverse to the handle, wherein the valve member has a bore therethrough extending transverse to the axis of rotation so that the valve member can be rotated between a first position in which the bore through the valve member is substantially aligned with the bore through the handle assembly so that flow is enabled along the handle assembly and a second position in which the bore through the valve member is substantially out of alignment with the bore through the handle assembly and flow is thereby restricted, and wherein a manually-actuable member extends from the valve member to enable the valve member to be rotated about its axis so that flow into the hose can be restricted to cause it to retract in length.
5. Vacuum cleaner apparatus according to Claim 4, wherein the manually-actuable member is rotatable.
6. Vacuum cleaner apparatus according to any one of Claims 2 to 5, wherein the valve member is substantially of ball shape.

7. Vacuum cleaner apparatus according to Claim 6, wherein the valve member has a plurality of grooves on its outer surface extending parallel to a bore through the valve member.
8. Vacuum cleaner apparatus according to any one of the preceding claims, wherein the handle assembly includes a spring arranged to urge the valve member to the first position.
9. Vacuum cleaner apparatus substantially as hereinbefore described with reference to Figures 1 to 4 of the accompanying drawings.
10. Vacuum cleaner apparatus substantially as hereinbefore described with reference to Figures 1 to 4 as modified by Figure 5 of the accompanying drawings.
11. A hose assembly for vacuum cleaner apparatus according to any one of the preceding claims.
12. A hose assembly substantially as hereinbefore described with reference to Figures 1 to 4 of the accompanying drawings.
13. A hose assembly substantially as hereinbefore described with reference to Figures 1 to 4 as modified by Figure 5 of the accompanying drawings.

14. A method of operating vacuum cleaner apparatus including the steps of applying suction to one end of a flexible hose, manipulating a cleaning head by means of a handle attached to the opposite end of the hose to clean, subsequently manually closing a valve in the handle to retract the hose in length, securing the hose in its retracted length and releasing the valve to enable it to open.
15. A method according to Claim 14, wherein the valve is manually closed by rotating a user-actuable member on the handle to rotate a valve member in the handle so as to close the valve and thereby retract the hose in length, wherein the hose is secured in its retracted length, and wherein the user-actuable member is released to enable the valve to open.
16. A method according to Claim 14, wherein the valve member is a ball shape.
17. A method of operating vacuum cleaner apparatus substantially as hereinbefore described with reference to Figures 1 to 4 of the accompanying drawings.
18. A method of operating vacuum cleaner apparatus substantially as hereinbefore described with reference to Figures 1 to 4 as modified by Figure 5 of the accompanying drawings.
19. Any novel and inventive feature or combination of features as hereinbefore described.



Application No: GB0412324.6

15

Examiner: John Wilson

Claims searched: 1-18

Date of search: 27 October 2004

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	1, 4, 5, 8, 11, 14, 15 at least	WO 03/04627 A1 Ragner & Derochemont - note p.12 line 17 et seq and figs. 10A, 10B, 11-17, 19
X	1, 4, 11, 14	DE 19738329 A1 BSH Bosch & Siemens - see WPI abstract accession no:1999-191196 [17] & EPODOC abstracts supplied and in particular the highlighted passages in the machine translation also supplied, and the figs.
X	1, 4, 11, 14 at least	WO 03/024294 A1 Smiths Group - whole document - see esp. fig.4

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^w :

A4F

Worldwide search of patent documents classified in the following areas of the IPC⁰⁷

A47L

The following online and other databases have been used in the preparation of this search report

Online: WPI, EPODOC, PAJ